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LAYING PERFORMANCE AS AFFECTED BY SOME BODY MEASUREMENTS AT 6 WEEKS OF AGE FOR INSHAS AS A NEW LOCAL STRAIN OF CHICKENS IN EGYPT.

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ABSTRACT

The study was conducted to investigate the effect of some body measurements at 6 weeks of age on productive performance. A number of112 pullets of Inshas strain were individually weighed with measuring shank, thigh and keel lengths at 6 weeks of age. Data on shank, thigh and keel lengths were classified into three groups: short, medium and long lengths. At 20 weeks of age pullets were transferred to individual layer cages until 40 weeks of age. At 36 weeks of age one egg was broken from each hen to determine egg quality traits.

The pullets of short thighs recorded ($P< 0.05$) earlier sexual maturity, while medium thighs recorded ($P < 0.05$) heavier body weight at sexual maturity than those of other lengths. Pullets of short shanks produced ($P < 0.05$) more eggs, higher egg mass and rate of laying than those of other lengths. However medium keel length pullets produced ($P < 0.05$) more eggs, higher egg mass and rate of laying than the other two groups. Shank length was negatively ($P < 0.05$) correlated with each of egg number, egg mass and rate of laying, while thigh length was positively ($P < 0.01$) correlated with age at sexual maturity. Long shank pullets produced ($P < 0.05$) eggs of higher values of Haugh unit than those of other shank lengths, while short thighs pullets produced ($P< 0.05$) eggs higher in values of yolk percentage than the other two groups. It could be stated that it is possible to predict the productive performance by using shank length at 6-weeks of age for Inshas strain.

Conclusively, it could be concluded that short shank length may be a good indicator of high egg production traits of Inshas as a new local strain of chickens.

Keywords : Local strain, body measurements, egg production, egg quality

INTRODUCTION

Many factors play important role in the productivity of laying hens and have been investigated by several workers. Verma *et al.* (l979) reported that body weight was positively and highly correlated with shank length at different ages. In addition, Tawfeek (1981) found that there were relationships between the growth rate and the length of each of thigh, shank and keel in Dokki-4 chicks. While, McDaniel *et al.* (l98l) showed that lighter body weight of breeding hens is accompanied by smaller eggs. Leeson and Summers (1990) found that body weight was of importance for maximum egg mass output. Havenstein *et al.* (1988) pointed to the importance of skeletal selection for conformation traits and egg production in chickens. Selection for body weight and body measurements may alter the efficiency of egg production in chickens (Renden *et al.*, 1984 and Renden and Marble 1986).

El-Wardany (1999 a, b) found that improving body weight, egg number and egg mass can be achieved in Gimmizah strain by keel length selection, while in Mamourah strain by shank length selection.

The present study was conducted to detect the relationships between egg production and some body measurements at 6 weeks of age for Inshas as a new local strain of chickens (Bakir *et al.*, 2002) that may enable to predict high egg production traits with respect to the body measurements at 6 weeks of age, under Egyptian environmental conditions.

MATERIALS AND METHODS

The experimental work was carried out at Inshas Research Station, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt. Day-old Inshas chicks were placed on a starter ration (Table 1) and water *ad libitum* until 8 weeks old. At 6 weeks old, 112 pullets (females) were individually weighed, wing banded and measured for some body conformation measurements (shank, thigh and keel lengths). Data on shank, thigh and keel lengths were classified according to the length to three categories within each body measurements according to the overall mean ± standard deviation, therefore, the first category included observations below the overall mean minus standard deviation the third category included observations above the overall mean plus standard deviation while the second category included observations which were in-between the first and the third categories accordingly the t–test should that the differences between the levels means within each factor were highly significant (Table 2). All pullets were placed on a grower ration (Table I) from 8 to 20 weeks of age. At 20 weeks of age pullets were individually housed in layer cages and placed on a layer ration (Table 1) and water *ad libitum* to 40 weeks of age.

Age at sexual maturity was estimated as days at which pullet laid its first egg and body weight was measured at this time to the nearest gram. Egg weight and number were daily recorded per hen during the first 90 days of laying, then the egg mass (egg number x egg weight average) and rate of laying were calculated per hen. At 36 weeks of age, one egg from each hen was broken to determine egg quality traits, then egg shape index was estimated as the ratio of the egg maximum width to its length, yolk index was calculated as the ratio of yolk height to its diameter, Haugh unit score was calculated for each individual egg according to Haugh (1937) and shell thickness in mm Arc-sine transformations were done for percentage of egg shape index, yolk percentage, yolk index, albumen percentage and shell percentage before stimulation of the data.

Data were analyzed according to General Linear Models (GLM) procedures by using SAS (1996) Computer Program System using the following model.

$Y_{ij} = \mu + T_i + e_{ij}$

Where: Y_{ij} = The observed dependent variable, μ = Overall mean, T_i = The i^{th} measurements (i = 1, 2 and 3) and e_{ij} = Random error.

Percentages were transformed to arcsine before being analyzed to approximate normal distribution. Multiple range tests were used to determine significance of the differences between means according to Duncan (l955). The correlation coefficient values were calculated among the parameters studied according to Steel and Torrie (1980).

Table 1: Starter, grower and layer rations composition.

Items	Starter	Grower	Layer
	0-8 wks	8-20 wks	20-40 wks
Ingredients	%	%	%
Yellow corn	65.00	63.00	66.00
Soybean meal 44%	30.45	15.50	21.30
Wheat bran	00.65	17.78	2.94
Di-calcium phosphate	1.80	1.25	1.50
Lime stone	1.40	1.80	7.60
Salt, iodized	0.30	0.30	0.30
Premix*	0.30	0.30	0.30
DL-Methionine	0.10	0.07	0.06
Calculated analysis**			
Crude protein %	19.28	15.20	15.68
ME Kcal / kg	2868.66	2689.87	2726.42
Calcium %	1.017	1.033	3.286
Available phosphorus %	0.42	0.45	0.40
Fiber %	2.725	4.475	3.330
Methionine %	0.429	0.327	0.455
Methionine + Cystine %	0.738	0.573	0.588
Lysine %	1.142	0.710	0.799

*Each kg of vit. & min. mixture contains: vit A 100000.000 IU, Vit D_3 300000.000 IU, Vit E l0 mg, Vit B_l 1 mg, Vit B_2 5 mg, vit B_6 1.5 mg, vit B_{12} l0 mg, Niacin 30 mg, Pantothenic acid l0 mg, Choline 250mg, capper 4 mg, iodine 3 mg, iron 30 mg Manganese 60 mg, zinc 50 mg Selenium 0.1 mg and Cobalt 0.1 mg

** According to NRC (1984).

Table 2: Distribution of pullets according to length of each measurement at 6 weeks of age for Inshas strain.

Body measurements	Categories	N	%	X ±SD.
Shank length	Short (< 3.1 cm)	15	13.40	2.92 ± 0.16^a
	Medium (3.1-3.7 cm)	74	66.10	3.40 ± 0.18^b
	Long (> 3.7 cm)	23	20.50	4.03 ± 0.24^c
Thigh length	Short (< 4.7 cm)	18	16.10	4.26 ± 0.29^a
	Medium (4.7-5.4 cm)	71	63.40	5.10 ± 0.24^b
	Long (> 5.4 cm)	23	20.50	5.82 ± 0.28^c
Keel length	Short (< 3.2 cm)	22	19. 60	3.00 ± 0.18^a
	Medium (3.2-3.9 cm)	66	58.90	3.56 ± 0.20^b
	Long (> 3.9 cm)	24	21.50w	4.16 ± 0.25^c

Means within each body measurement followed by the same letters are not significantly ($P < 0.05$) different.

RESULTS AND DISCUSSION

1-Egg production traits:

The obtained results of the productive performance of laying hens with respect to body measurement categories are presented in Table 3. It seems that shorter shank pullets produced significant ($P < 0.05$) more eggs, egg mass and rate of laying than those of medium or long shanks.

El-Weardany (l999 a, b) came the same conclusion in Mamourah strain. On the other hand, the shank length had no significant effects on the other studied productive performance traits either at sexual maturity or during the 1st 90 days of laying.

The pullets of thighs sexual matured earlier than those of medium and long thighs by about 11.0 and 4.1 days respectively. On the other hand they had less body weight at sexual maturity than those of medium and long thighs by about 5.6 and 1.7 % , respectively (Table 3). It was noticed that the thigh length had no obvious effects on all studied traits at 1st 90 days of laying as well as the egg weight at sexual maturity. Also, from data in Table 3 shows that the pullets of medium keel lengths produced significantly ($P < 0.05$) more egg number, egg mass and rate of laying than those of short or long keels by about 8.6 and 3.4 eggs, respectively for egg number and by about 419.7 g and 141.2 g, respectively for egg mass and by about 9.6 and 3.7 % , respectively for rate of laying. On the other hand the effect of keel length in egg weight at 1st 90 days of laying did not significant. These results agreed with those obtained by El-Weardany (1999 a, b) who found that improving egg number and egg mass can be achieved in Gimmizah strain by keel length selection.

Table 4 shows that there were negatively significant ($P<0.05$) correlation coefficients between shank length and each of live body weight at sexual maturity as well as egg number, egg mass and rate of laying at the first 90 days of laying. This trend of the negative estimates indicates that short shank associated with better of egg production traits. From these results, shank length may be a good indicator for high egg production traits. Similar results were obtained by Renden *et al.* (1984), Renden and Marble (1986), Havenstein *et al* (1988) and El-Wardany (1999a, b).

On the other hand, low positive and insignificant coefficients of correlation among thigh or keel lengths and most egg production traits were noticed, except age at sexual maturity which was positively significant ($P < 0.01$) with thigh length. This trend indicated that long thigh length may be associated with late matured hen with decreasing the rate of laying. Therefore, mature body weight and body measurement are related to productive and reproductive performance (Brody *et. al,* 1980 and 1984; Summers and Leeson, 1984 and Zelenka *et al.*, 1984).

Generally, it could be concluded that it is possible to predict the productive performance for Inshas strain by using shank length measurement at 6 weeks of age for Inshas strain.

Table 3: Least square means (±SE) of egg production traits of Inshas laying hens as affected by body measurements categories at 6 weeks of age.

Body measurements	At sexual maturity			First 90 days of laying			
	Age (days)	Body weight (g)	Egg weight (g)	Egg number	Egg weight (g)	Egg mass (g)	Rate of laying (%)
Shank length:	N. S.	N. S.	N. S.	*	N. S.	*	*
Short	173.3± 3 .7	1382.6±34.1	34.2±1.2	53.4± 4.0^{a}	42.1±0.8	2253.3±172.5^{a}	59.3±4.4^{a}
Medium	173.3±5.0	1378.9±18.2	34.1±0.6	44.4±2.1^{b}	41.7±0.4	1840.1±92.0^{b}	49.3±2.3^{b}
Long	177.2±3.3	1433.2±29.6	35.4±1.1	45.5±3.4 ^{b}	42.7±0.7	1947.1±150.4^{b}	50.6±3.8^{b}
Thigh length:	*	*	N. S.	N. S.	N. S.	N. S.	N. S.
Short	169.5±3.5^{b}	1365.1±31.2^{b}	33.7±1.1	48.9±3.7	42.3±0.8	2060.9±161.1	54.3±4.1
Medium	180.5±2.1^{a}	1440.9±19.6^{a}	34.5±0.7	46.1±2.3	41.7±0.5	1937.0±90.1	51.2±2.5
Long	173.6±3.0^{ab}	1388.7±27.6^{ab}	35.4±1.0	48.2±2.3	42.4±0.7	2042.5±139.8	53.6±3.6
Keel length:	N. S.	N. S.	N. S.	*	N. S.	*	*
Short	175.1±3.4	1404.3±31.2	34.9±1.1	43.1±3.6^{b}	41.3±0.7	1780.8±157.9^{b}	47.9±4.0^{b}
Medium	172.1±2.1	1379.3±18.9	34.4±0.7	51.7±2.2^{a}	42.5±0.5	2200.5±95.6^{a}	57.5±2.4^{a}
Long	176.5±2.8	1411.1±25.6	34.3±0.9	48.3±3.0^{ab}	42.6±0.6	2059.3±129.6^{ab}	53.8±3.3^{ab}

Means in each column within each body measurements bearing the same superscripts are not significantly different (P < 0.05).
NS = Not significant and * = (P < 0.05).

Table 4: Correlation coefficients (r) between body measurements at 6 week s of age and some laying traits.

Items	Shank length	Thigh length	Keel length
	At 6 weeks of age		
At sexual maturity:			
Age	-0.025	0.273**	-0.028
Body weight	-0.242*	0.075	0.039
Egg weight	-0.142	0.079	-0.055
At first 90 days of laying :			
Egg number	-0.229*	0.001	0.006
Egg weight	-0.065	0.155	0.121
Egg mass	-0.247*	0.039	0.027
Rate of laying	-0.229*	-0.010	0.011

* = (P< 0.05) and ** = (P < 0.01)

2. Egg quality traits:

Results presented in Table 5, showed that long shanks pullets recorded (P < 0.05) higher values of Haugh unit than those of medium or short shanks. While the other egg quality traits did not significantly affected by shank length. Hanafi and El-Labban (1990) indicated that short shanks associated with high rate of laying, which produced small eggs with less value of Haugh unit.

However, short thighs pullets produced (P < 0.05) eggs with higher values of yolk (%) than those of medium or long ones. This trend indicated that short thigh length may be associated with small body weight at sexual maturity which produced small eggs with high yolk percent. Similar results were obtained by Ezzeldin and El-Labban (1989) and Hanafi and El-Labban (1990) who found that egg weight was positively correlated with body weight and was negatively correlated with Yolk percentage value. On the other hand, the present data show that there were no significant differences between keel length and any of the studied egg quality traits (Table 5).

Table 6 shows that there were positively significant (P < 0.01) correlation coefficient between shank length and Haugh units, while the most other correlations were positively insignificant. This trend indicated that long shanks may be associated with late mature hen which characterized on high Haugh unit, while long keels may be associated with thin shell thickness. However, the correlation coefficients between thigh length and yolk percentage were negatively significant (P < 0.05), while the other correlations between thigh length and most of the studied parameters were insignificant. Similar results were reported by Amer (1972) and Hanafi (1981).

Table 5: Least square means (±SE) of egg quality traits of the Inshas laying hens as affected by body measurements categories at 6 weeks of age.

Body measurements	Egg shape index	Yolk wt %	Yolk index	Albumen wt %	Haugh unit	Shell wt %	Shell thickness (mm)
Shank length:	**N. S.**	**N. S.**	**N. S.**	**N. S.**	*	**N. S.**	**N. S.**
Short	77.29±1.57	30.91±1.07	46.39±1.64	55.75±1.11	81.7±3.6^{b}	13.34±0.63	0.37±0.02
Medium	76.20±0.50	30.49±0.34	48.57±0.53	55.85±0.36	86.2±1.2^{ab}	13.72±0.20	0.37±0.01
Long	77.10±0.82	29.98±0.56	48.68±0.86	56.37±0.58	89.3±1.9^{a}	13.46±0.33	0.37±0.01
Thigh length:	N. S.	*	N. S.	N. S.	N. S.	N. S.	N. S.
Short	78.51±1.23	32.09±0.80^{a}	47.20±1.33	54.74±0.86^{a}	83.5±2.9	13.16±0.51	0.37±0.01
Medium	76.50±0.98	29.51±0.63^{b}	48.04±1.06	56.77±0.68^{a}	86.1±2.3	13.70±0.40	0.37±0.01
Long	76.71±1.18	29.50±0.76^{b}	48.25±1.27	56.88±0.82^{a}	87.4±2.8	13.68±0.48	0.37±0.01
Keel length:	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.
Short	78.36±2.91	28.48±1.88	47.90±3.14	57.73±2.03	85.7±6.8	13.88±1.20	0.39±0.03
Medium	76.43±1.16	30.99±0.75	47.94±1.25	55.37±0.81	85.8±2.7	13.48±0.48	0.37±0.01
Long	76.94±1.21	31.62±0.78	47.66±1.31	55.29±0.84	85.6±2.8	13.19±0.50	0.36±0.01

Means in each column within each body measurements bearing the same superscripts are not significantly different ($P < 0.05$).
NS = Not significant and * = ($P < 0.05$).

Table 6: Correlation coefficients (r) between body measurements at 6 weeks of age and some egg quality traits.

Items	Shank length	Thigh length	Keel Length
	At 6 weeks of age		
Egg shape index	-0.008	0.001	-0.096
Yolk percentage	0.056	-0.264*	0.011
Yolk index	0.019	0.031	0.065
Albumen percentage	0.120	0.158	0.085
Haugh unit	0.270**	0.153	-0.007
Shell percentage	0.148	0.004	-0.021
Average shell thickness (mm)	-0.020	-0.001	-0.214*

* = (P < 0.05) and **= (P < 0.01).

In conclusively, it could be concluded that short shanks at 6 weeks of age may be a good indicator for some high egg production traits of Inshas laying hens as a new local strain of chickens in Egypt. Further, future studies are needed for these points to be investigated.

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تأثير بعض مقاييس الجسم عند عمر ٦ أسابيع علي الأداء الإنتاجي لسلالة دجاج أنشاص المستنبطة حديثا في مصر.

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اجري البحث لدراسة تأثير بعض مقاييس الجسم عند عمر ٦ أسابيع علي الأداء الإنتاجي لسلالة أنشاص المستنبطة محليا، حيث تم وزن ١١٢ أنثى بداري وتم أخذ بعض مقاييس الجسم مثل طول الساق وطول الفخذ وطول عظمة القص فرديا عند عمر ٦ أسابيع وتم تقسيم الأطوال لكل منهم إلي قصير ومتوسط وطويل وعند عمر ٢٠ أسبوع تم نقلهم إلي أقفاص التسجيل الفردي وتم تسجيل البيض (عدد و وزن) فرديا حتى عمر ٤٠ أسبوع وقد

أخذت بيضة لكل أم عند ٣٦ أسبوع من العمر لتقدير صفات جودة البيض وقد أمكن الحصول علي النتائج التالية:

١- نضجت البداري ذات الفخذ القصير جنسيا مبكرا (٥%)بينما البداري ذات الفخذ المتوسط كانت أثقل وزنا عند النضج الجنسي (٥ %).

٢- أعطت البداري ذات الساق القصير وذات الطول المتوسط لعظمة القص بيضا أكثر عددا و أثقل وزنا وكانت ذات معدل عالي من الإنتاج (٥ %).

٣- كان الارتباط المظهري بين طول الساق وعدد ووزن البيض ومعدل الإنتاج معنويا (٥ %) وسالبا بينما كان الارتباط المظهري بين طول الفخذ وعمر النضج الجنسي معنويا (١ %) وموجبا.

٤- أعطت البداري ذات الساق القصير بيضا ذو قيم عالية لوحدات الهو (٥%) بينما البداري ذات الفخذ القصير أعطت بيضا ذو قيم عالية لنسبة الصفار المئوية (٥%).

٥- كان الارتباط المظهري بين طول الساق ووحدات الهو معنويا (١ %) وموجبا بينما كان الارتباط المظهري بين طول الفخذ والنسبة المئوية للصفار معنويا (٥ %) وسالبا وكذلك الارتباط المظهري بين طول عظمة القص وسمك القشرة كان معنويا (٥%) وسالبا.

مما سبق يمكن القول أنه يمكن التنبؤ بإنتاج البيض باستخدام طول الساق عند عمر ٦ أسابيع لسلالة أنشاص .